

C L A I M S

1. A hybrid riser configuration having a submerged tower
5 (4) comprising a plurality of riser pipes (10) substantially inserted in guide conduits (9), and also having buoyancy means (6) and tethering tension means, the riser pipes (10) and guide conduits (9) being connected to a base (5) anchored to the ocean floor,
10 characterised in that a plurality of the guide conduits (9) are acting as multiple tethers, each guide conduit (9) further acting as a radial constraint in elastic deformation (Euler) of the riser pipe (10) inside.
- 15 2. A hybrid riser configuration according to claim 1, characterised in that the riser pipes (10) and guide conduits (9) are rigidly connected both to the base (5) and the buoyancy means (6) of the riser configuration.
- 20 3. A hybrid riser configuration according to claim 1 or 2, characterised in that the material of the guide conduits (9) comprises aluminium or a similar light metal.
- 25 4. A hybrid riser configuration according to any one of the preceding claims, characterised in that it is protected by sacrificial anodes.
- 30 5. A hybrid riser configuration according to any one of the preceding claims, characterised in that during tow-out and installation, the guide conduits (9) provide necessary
35 buoyancy to make the riser configuration, except the base (5) and buoyancy means (6), near neutrally buoyant.

6. A method for installing a riser configuration having a submerged tower (4) comprising a plurality of riser pipes (10) substantially inserted in guide conduits (9) and also having a buoyancy tank (6) and gravity base (5) connected by said riser pipes (10) and guide conduits (9), comprising the steps of:

- fabricating a bundle (4) of guide conduits (9) and riser pipes (10) on a roller bed or rail bed from which it can be launched,

- connecting the buoyancy tank (6) and gravity base (5) to opposite ends of said bundle,

- sealing at least a plurality of the guide conduits (9) and riser pipes (10) of the bundle (4),

- launching the resultant structure and connecting the buoyancy tank and gravity base ends of the structure to respective towing vessels (17) via towing wires (18),

- flooding the buoyancy tank (6) to provide it with substantial negative buoyancy so that both the tank (6) and the base (5) will act as clump weights,

- towing the structure (4,5,6) to the offshore location for its installation as a sub-surface tow while maintaining sufficient angle and tension in the towing wires (18) to maintain substantial tension in the pipe bundle (4),

- lowering the base (5) end of the structure (4-6) by paying out the towing wire connected to the base (5),

- permitting water to enter the spaces formed between the riser pipes (10) and their respective guide conduit (9) when the base (5) has reached a predetermined depth in order to limit the differential pressure across the wall of the guide conduits (9),

- continuing lowering the base end of the structure until the structure is perpendicular and suspended from the towing wire (18) connected to the buoyancy tank (6), and

- lowering the structure to allow the base (5) to penetrate the bottom (2) mud-line and anchoring the base to the ocean floor, and removing the water ballast and towing wire (18) from the buoyancy tank, thus providing tension in the guide conduits (9).

7. A method according to claim 6, wherein a motion compensating system is employed in the towing wire (18) between the buoyancy tank (6) and surface vessel (17).

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8. A method according to claim 6 or 7, wherein the guide conduits (9) are fabricated by welding together sections of aluminium pipe using friction stir welding.

10 9. A method according to any one of claims 6-8, wherein said guide conduits (9) are made by joining sections of aluminium pipe which are made with a longitudinal seam welded by means of friction stir welding.

15 10. A method according to any one of claims 6-9, wherein at least some of the annular spaces between the riser pipes (10) and the corresponding guide conduits (9) are filled with a gel after expelling any water having entered said spaces during installation of the structure.

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